

High Dietary Fiber and Antioxidant Cookies with Substituted Parchment and Silver Skin Coffee

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ABSTRACT

High coffee production in Indonesia effected the increase of by-products from the processing of coffee beans. Parchment and silver skin are by-product obtained during the processing of coffee beans. Parchment and silver skin are used as compost, biogas, and has not been widely used as a food ingredient. Both have a high dietary fiber content and antioxidant activity. In this research, we make cookies with parchment and silver skin flour. Parchment and silver skin flour were added with concentrations consist of 0%, 1%, 2.5%, and 5%. Based on organoleptic assay with the parameters of color, aroma, taste, texture and level of preference, the best cookies were the addition of 2.5% parchment flour. These cookies have nutritional that fulfill the quality standards of cookies (SNI -2973-2011), namely 7.76% protein, 20.86% fat and 1.31% ash. In addition, these cookies have a high content of dietary fiber and antioxidants, namely 13.67% and 43.86%. So, these cookies can be a healthy snack option because have high dietary fiber and antioxidant.

Keywords: *Antioxiant; Coffee By Product; Cookies; Dietary Fiber; Parchment; Silver skin.*

INTRODUCTION

Coffee is one of Indonesia's mainstay commodities in the sector plantation. In 2016-2017 coffee production in Indonesia has increased of 8.51 from 632.00 thousand tons of coffee to 685.80 thousand tons of coffee. In 2019, Coffee production in Central Java reached 22.3 thousand tons. The high production of coffee in Indonesia, the process of processing coffee and processed coffee products will also increase (Engineering & Earth, 2020). This has an impact on the coffee waste generated from the coffee processing process which will also increase. One of those efforts this is done by utilizing coffee skin waste that has not yet been processed attention of business people. Business opportunities from coffee skin waste are becoming some products that have use value and high selling value. Utilization Coffee skin is well known abroad, but in Indonesia there are not many of them know that coffee skin turns out to have many benefits and can produce several useful products.

Coffee parchment and silver skin are the by-products obtained during the coffee bean processing. Parchment is obtained after the fermentation process and silver skin obtained after the roasting process. Both have content high food fiber has the potential to have a low GI so it can prevent diabetes and high antioxidant activity. Research by Mussatto et al. (2011) use silver skin coffee in flakes, bread, biscuits and snacks. Pourfarzad, et al. (2013) research used silver skin coffee to improve the quality, shelf life and sensory properties of bread flattened Barbari, as well as reducing calorie density and increasing content dietary fiber (Anabela, 2018).

Coffee parchment dietary fiber has the potential to produce bread-free formulations gluten (Iriondo, 2020). Bread enriched with parchment flour has high fiber content (6.25%). In addition, based on Castillo's research, 2017 made cookies with 2% coffee parchment flour as a fiber source food and antioxidants. In this research, we make cookies innovation by using

silver skin flour and parchment substitution. These cookies can be a healthy snack choice with high dietary fiber and antioxidants from the use of these two materials.

METHODS

Material

The main ingredients used parchment and silver skin from the Arabica coffee, which is obtained from coffee bean processors in Semarang. The ingredients used in the making of cookies are wheat flour, skim milk, eggs, margarine, powdered sugar, vanilla, baking powder, cornstarch, mocha coffee flavoring and coloring additives.

Tool

The tools used are stoves, stirrers, filters, weigher, dehydrators, grinders, and oven.

Research Design

This research consists of several stages, consist of making of flour parchment and silver skin, making cookies, and evaluation cookies with organoleptic analysis, proximate analysis (moisture, ash, carbohydrates, protein, and fat), total dietary fiber analysis, and antioxidant activity analysis. The following is the scheme of this research:

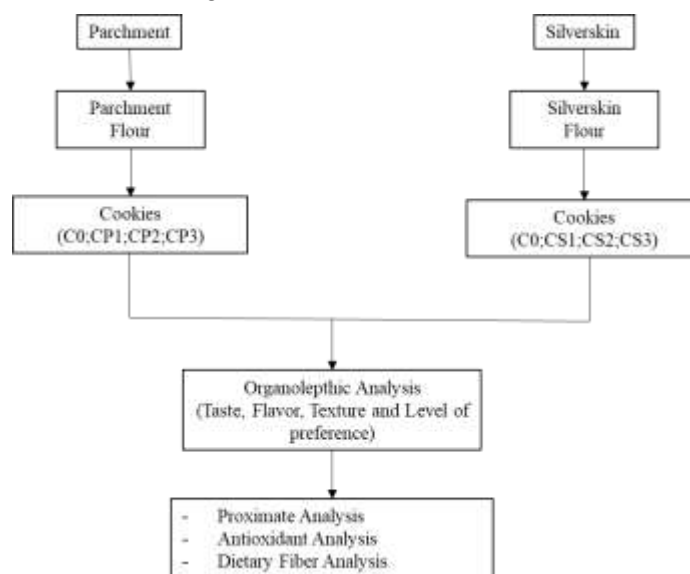


Figure 1. The Schema of Research

Making of Parchment and Silver skin Flour

Extraction parchment and silver skin are made based on WO 2013/004873 patent. 50 grams of parchment/silver skin is added per milliliter of water, heated for 10 minutes at 100°C, then filtered. The filtrate is dried used dehydrator to a constant weight. After drying, the coffee waste is ground into flour used grinder and filtered, then stored in a closed container.

Making of Cookies

Cookies formula consist of control (C0), Cookies with adding parchment flour 2.5% (CP1); Cookies with adding parchment flour 5% (CP2); Cookies with adding parchment flour 10% (CP3); Cookies with adding silver skin flour 2.5% (CS1); Cookies with adding silver skin flour 5% (CS2); and Cookies with adding silver skin flour 10% (CS3). To make cookies with the addition of parchment flour, the first thing to do is weigh all the ingredients based on

Table 1. After weighing, the ingredients are mixed and stirred until perfectly mixed. Do the same thing for cookies with the addition of silverskin flour by weighing all the ingredients based on Table 2. The dough is shaped like cookies, weighing 10 grams each and baked at 120 °C for 30 minutes.

Table 1. Cookies With Adding Parchment Flour Formula

Materials	C0	CP1	CP2	CP3
Wheat Flour	150	147,5	145	140
Silver skin Flour	-	2,5	5	10
Parchment Flour	-	2,5	5	10
Skim milk	15	15	15	15
Coffee powder	3	3	3	3
Egg	1	1	1	1
Margarine	100	100	100	100
Sugar	70	70	70	70
Vanilla	2	2	2	2
Baking powder	2	2	2	2
Maizena	15	15	15	15
Food Coloring	1	1	1	1

Table 2. Cookies With Adding Silverskin Flour Formula

Materials	C0	CS1	CS2	CS3
Wheat Flour	150	147,5	145	140
Silver skin Flour	-	2,5	5	10
Parchment Flour	-	2,5	5	10
Skim milk	15	15	15	15
Coffee powder	3	3	3	3
Egg	1	1	1	1
Margarine	100	100	100	100
Sugar for Diabetic	70	70	70	70
Vanilla	2	2	2	2
Baking powder	2	2	2	2
Maizena	15	15	15	15
Food Coloring	1	1	1	1

Evaluation Cookies

Organoleptic Analysis

The organoleptic test was carried out based on the assessment of taste, flavor, texture and level of preference using the hedonic test method on 20 untrained panelists.

Proximate Analysis

The proximate test consists of testing the levels of energy, protein, carbohydrates, fat, ash and water. Moisture content was measured using the gravimetric method, ash content using the gravimetric method, carbohydrates using the by difference method based on SNI 01-2891-1992, protein content using the Kjeldahl method based on AOAC 981.10.2005, and fat content using the Soxhlet method based on AOAC 991.26.2005.

Total Dietary Fiber Analysis

Testing Food Fiber as TDF (Total Dietary Fiber) (AOAC, 1995). 0.5 grams of sample in an Erlenmeyer and added 0.1 ml of the alpha amylase enzyme. Then heated in a water bath with a temperature of 100 °C for 15 minutes while stirring occasionally. Then the sample was removed and cooled, then 20 ml of distilled water was added and 5 ml of 1 N HCL was added. Furthermore, 1 ml of 1% pepsin enzyme was added to the Erlenmeyer containing the sample, this enzyme functions as a protein cutter. Then heated in a water bath for 1 hour. After that, 5 ml of NaOH 1 N was added and 0.1 ml of beta amylase enzyme was added to the Erlenmeyer. Then the Erlenmeyer was closed and incubated in a water bath for 1 hour. Then filtered using constant filter paper whose weight is known. Furthermore, the sample was washed using ethanol and acetone 10 ml each 2 times. The sample was then dried using an oven at 105 °C for 1 night, cooled in a desiccator and weighed the final weight (insoluble food fiber). Then the volume of the filtrate was adjusted to 100 ml and 400 ml of warm 95% ethanol was added. The filtrate was allowed to settle for 1 hour, then filtered with ash-free filter paper, then washed again with ethanol and acetone as above. Then dried overnight in the oven at 105°C. Then put in the desiccator and weigh the final weight (dissolved food fiber). Food fiber content can be calculated by the formula:

$$\text{Total dietary fiber} = \text{Dissolved dietary fiber} + \text{Insoluble dietary fiber}$$

Antioxidant Activity Analysis

Antioxidant activity testing cookies performed using the DPPH (2,2 diphenyl-1-picrylhydrazyl) method. The sample was destroyed and added methanol solution. The solution is then filtered and carried out antioxidant analysis. The sample is made of solution stock with a concentration of 1,000 ppm in methanol solution. The sample solution is diluted so that the sample solution obtained with concentration series namely 200, 400, 600, 800, and 1,000 ppm. Each sample solution concentration 4 mL was taken and reacted with 1 mL of DPPH solution. Sample absorbance was measured using spectrophotometer at wavelength 517 nm. Percent inhibition (% inhibition) can be calculated using the formula below This:

$$\text{Inhibition (\%)} = \frac{\text{Blank Absorbance} - \text{Sample Absorbance}}{\text{Sample Absorbance}} \times 100\%$$

Data Analysis Test

The analytical design used for the main research was processed using software Microsoft Excel and continued with SPSS Statistic 23. Duncan's multiple range tests was used to determine the difference of means, and $P \leq 0.05$ was considered to be statistically significant.

RESULTS AND DISCUSSION

The Color of Parchment and Silver Skin Flour and Cookies with the Addition of Parchment and Silver Skin Flour

Silver skin flour's color is darker than parchment flour (Figure 2). Silver skin obtained from the roasting process (Castillo, 2018) so it has a darker color and a stronger aroma than parchment. Roasting is a complex heat transfer process. Changes in size, color and taste of coffee beans during roasting can occur due to reactions that occur during roasting such as Maillard reactions, pyrolysis, oxidation and caramelization (Suud, 2021).



Figure 2. Parchment (A) and Silver Skin (B) Flour

Formulation cookies with the addition of parchment flour (CP1, CP2, and CP3) had color and aroma that were different with control (C0) (Figure 3). Cookies with the addition of silver skin flour (CS1, CS2, and CS3) have a darker color than cookies with the addition of parchment flour.

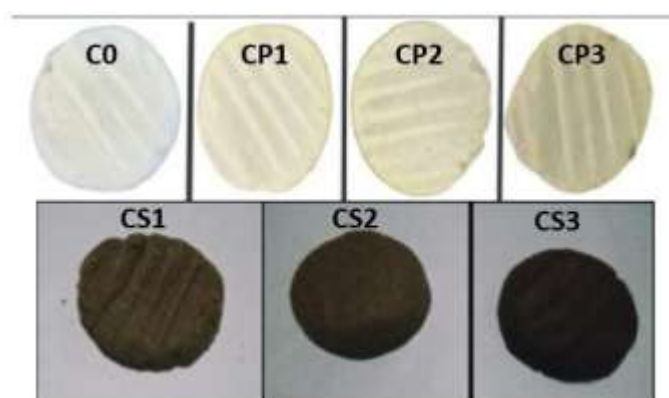


Figure 3. Cookies Control (C0); Cookies Parchment Flour 2.5% (CP1); Cookies Parchment Flour 5% (CP2); Cookies Parchment Flour 10% (CP3); Cookies Silver Skin Flour 2.5% (CS1); Cookies Silver Skin Flour 5% (CS2); and Cookies Silver Skin Flour 10% (CS3)

Organoleptic Analysis

Table 2. Organoleptic Analysis of Cookies Control (C0); Cookies Parchment Flour 2.5% (CP1); Cookies Parchment Flour 5% (CP2); Cookies Parchment Flour 10% (CP3); Cookies Silver Skin Flour 2.5% (CS1); Cookies Silver Skin Flour 5% (CS2); and Cookies Silver Skin Flour 10% (CS3)

Sample	Flavor	Taste	Texture	Level of Preference
C0	4 ^a	4 ^a	3.8 ^a	3.6 ^{ab}
CS1	3.7 ^a	3.7 ^a	3.65 ^{ab}	3.4 ^{ab}
CS2	3.7 ^a	3.7 ^a	2.95 ^c	3.15 ^{ab}
CS3	3.5 ^{ab}	3.5 ^{ab}	3.6 ^{ab}	2.2 ^c
CP1	3.45 ^{ab}	3.45 ^{ab}	3.55 ^{ab}	3.85 ^a
CP2	3.05 ^b	3.05 ^b	3.5 ^{ab}	3.8 ^a
CP3	2.3 ^c	2.3 ^c	3.45 ^{ab}	3.55 ^{ab}

The mean followed by different letters in the same column shows a significant difference ($p < 0.05$)

In Table 2, the flavor shows that cookies with the addition of 2.5% parchment flour (CP1) and 10% parchment flour (CP3) were most liked, meanwhile cookies with the addition of 10% silver skin flour (CS3) was least liked. The taste shows that the addition of 2.5% parchment flour (CP1), addition of 5% parchment flour (CP2), and the addition of 10% parchment flour (CP3) was most liked, meanwhile cookies with the addition of 10% silver skin flour (CS3) was least liked. This shows that silver skin flour can provide a very strong aroma from the roasting process that cover the flavor of cookies and can cause a bitter taste.

The texture shows that the cookies control (C0) was most liked than the cookies with the addition parchment and silver skin. This is because cookies with the addition parchment and silver skin have a higher water content compared to the standard quality of cookies (SNI -2973-2011) so that it gives a softer texture which is not liked by the panelists. So, in making the cookies can be added flour that can reduce the water content.

The level of preference shows that cookies with the addition of parchment flour 2.5% (CP1) and the addition of 5% parchment flour (CP2) were most liked, meanwhile cookies with the addition of 10% silver skin flour (CS3) was least liked. CP1 and CP2 provide taste and flavor that acceptable by the panelists. CS3 gets a low score because silver skin can give bitter taste and strong flavor from the roasting process so it covers flavor of cookies. From the overall assessment in the organoleptic analysis, was shown that the most liked were cookies with addition of 2.5% parchment flour (CP1). Furthermore, the best cookies will be tested for their nutritional content and antioxidant activity.

Nutrient Content of Cookies

Table 3. Nutritional Content of Cookies with Addition of 2.5% Parchment Flour

Nutritional Content	Quantity	The Quality Standards Cookies (SNI -2973-2011)
Water (%)	5,57	Max 5
Ash (%)	1,31	Max 1,6
Protein (%)	7,76	Min 5
Lipid (%)	20,86	Min 9,5
Carbohydrate (%)	64,46	Min. 70
Energy (kal/100g)	470,25	Min. 400
Dietary Fiber (%)	13,67	Max 0,5%
Antioxidant (%)	43,86	-

The mean followed by different letters in the same column shows a significant difference ($p < 0.05$)

In Table 3, the nutritional content of ash, protein and fat meets the quality standards of cookies based on SNI -2973-2011. The water content of cookies exceeds the quality standard cookies that contains 5.57%. The texture of cookies with the addition of 2.5% parchment flour were softer than cookies control. Water content of cookies can be influenced by environmental humidity, ingredients and baking time cookies parchment flour.

Dietary fiber content cookies with the addition of 2.5% parchment flour exceed quality standards cookies namely 13.67% (Table 3). It caused high dietary fiber of parchment. However, this dietary fiber content can fulfill the fiber needs of diabetics. Diabetics are advised to consume snacks 2-3 times a day that have 10-15% fiber content at each meal of the total requirement. The need for dietary fiber for snacks a day is 7.5 grams (Ginola, 2019). Therefore, these cookies can be used as a snack for diabetics.

Based on the results of testing the antioxidant content showed the number 43.86% (Table 3). Parchment has bioactive components that act as antioxidants like caffeine, chlorogenic acid and polyphenols. These compounds play a role in donating hydrogen atoms to oxidized molecules (Elva et al. 2017). Cookies from 20% of coffee cherry skin flour and 60% arrowroot starch have an antioxidant activity of 40.10% (Damat, et al, 2019). It shows cookies with the addition of 2.5% parchment flour can be used as a healthy snack with high antioxidant fiber content.

CONCLUSION

Cookies with the addition of 2.5% parchment is most liked by the panelists based on the parameters of aroma, taste, texture and level of preference. It have nutritional value (ash, protein, energy) that fulfill the quality standards of cookies (SNI -2973-2011). These cookies also have a high dietary fiber content of 13.67% and 43.86% antioxidants, so they have the potential as a functional food ingredient.

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